Chapter 2: Drop-Offs

2.1 Introduction

The intent of this chapter is to provide general guidelines for mitigating longitudinal pavement edge or terrain drop-off conditions created by construction operations in highway work zones. All measures employed to mitigate drop-offs within construction, maintenance and utility work zones shall be utilized in conformance with the current editions of the Manual on Uniform Traffic Control Devices (MUTCD), North Carolina Supplement to the MUTCD for Streets and Highways, North Carolina Standard Specifications for Roads and Structures, NC Roadway Standard Drawings and the North Carolina Maintenance/Utility Traffic Control Guidelines. (MUTCG)

2.2 Definitions & Abbreviations

Drop-off – The difference in elevation between existing pavement or terrain and the lowest elevation created by construction operations.

Edge of Pavement (EOP) – The longitudinal joint where the roadway joins the shoulder, or curb and gutter line.

Edge of Shoulder (EOS) – The longitudinal edge of the shoulder away from the roadway at which a shoulder break occurs transitioning to the side slope.

Edge of Travelway (EOT) – The longitudinal edge of the travelway used by traffic, normally defined by pavement marking edgeline or channelizing devices.

Intermediate-term Stationary – Work that occupies a location more than one daylight period up to three (3) days, or nighttime work more than one (1) hour.

Long-term Stationary – Work that occupies a location more than three (3) days.

Roadway – A roadway shall be defined as contained in the Uniform Vehicle Code, “That portion of a highway improved, designed, or ordinarily used for vehicular travel, exclusive of the berm or shoulder”. Furthermore, as pertains to the work zone environment, a roadway may or may not be utilized by traffic in a particular phase of construction. Therefore, for communication purposes, the roadway is the actual pavement regardless of whether or not it is being utilized by traffic.

Short Duration – Work that occupies a location up to one (1) hour.

Short-term Stationary – Daytime work that occupies a location for more than one (1) hour within a single daylight period.

Traffic Barrier- A guardrail that keeps vehicles within their roadway and to prevent collisions with obstacles or cars in another lane. A traffic barrier is also used in order to prevent cars from entering steep slopes or deep water.

Travelway – A travelway shall be defined as the portion of the highway utilized by traffic, that is designed and intended for vehicular use. In a work zone environment this may include locations such as the roadway, shoulders, temporary pavements, detour routes, or other locations where traffic may be placed during the progress of construction. If a lane has been closed to traffic, the closed lane will not be considered a travelway since it no longer is intended to be used by traffic.

Travel Lane – A travel lane is one part of the travelway, which may be divided into one or more lanes designating the direction and separation of traffic flow.

2.3 Design Resources

"Traffic Control Strategies in Work Zones with Edge Drop-Offs", CTRE Project 97-15. Study performed by Iowa State University Department of Civil and Construction Engineering for the Iowa Department of Transportation.

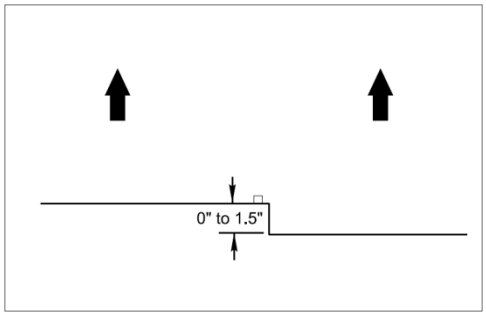
2.4 Guidelines

LONGITUDINAL DROP-OFFS

Pavement Edge Drop-offs Within or adjacent to the Travelway

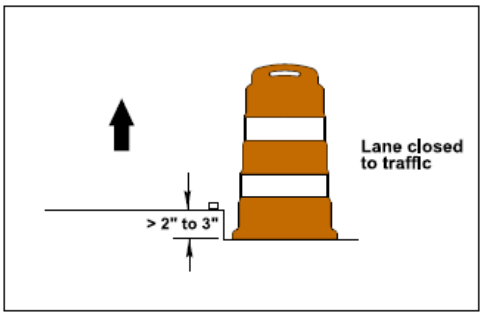
Drop-offs located within a travelway where traffic is expected to traverse during a lane change maneuver, or a passing situation. This includes all multilane and two-lane, two-way travelways regardless of existing passing or no-passing zones.

A) Drop-offs less than or equal to 1.5 inches:
For drop-offs less than or equal to 1.5 inches no protection or channelizing devices are required. However, advance warning "UNEVEN LANES" signs (W8-11) shall be installed 500 feet in advance and installed once every half mile where the posted speed is less than 45 mph and installed once every mile where the posted speed is greater than or equal to 45 mph throughout the length of the drop-off area.



B) Drop-offs greater than 2 inches but less than or equal to 3 inches:

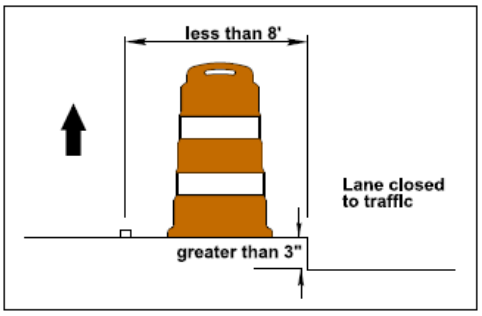
Where a drop-off in a travelway exceeds 2 inches but is less than or equal to 3 inches the affected lane(s) shall be closed to traffic. Advance warning "UNEVEN LANES" signs (W8-11) shall be installed 500 feet in advance and installed once every half mile where the posted speed is less than 45 mph and installed once every mile where the posted speed is greater than or equal to 45 mph throughout the length of the drop-off area.



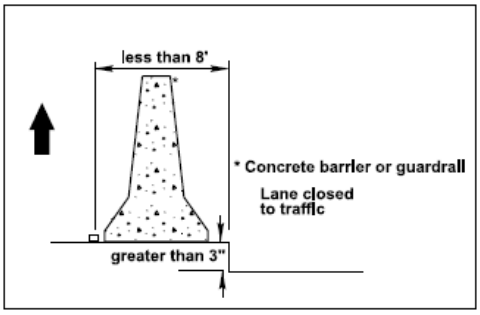
C) Drop-offs greater than 3 inches:

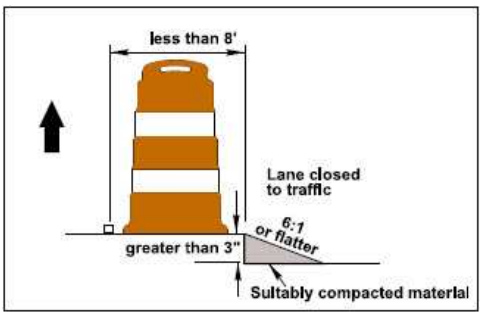
Where a drop-off in a travelway is greater than 3 inches the affected lane(s) shall be closed to traffic and the drop-off protected with traffic barrier, sloped wedge, drums, or cones as follows:

- Drop-offs greater than 3 inches and within 8 feet of an open travel lane may be protected with drums or cones provided work operations are Short Duration or Short-term Stationary, are of short lengths (200 feet maximum), the work is being performed in the drop-off area, and the drop-off will not remain overnight.

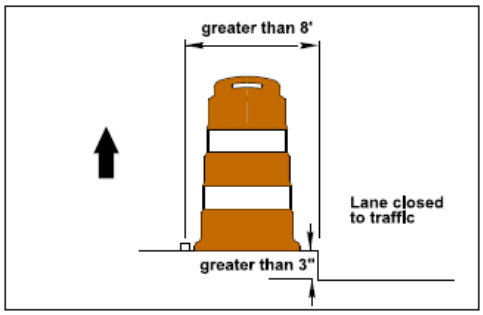


- Drop-offs greater than 3 inches and within 8 feet of an open travel lane in work zones where operations are LONG-TERM STATIONARY or INTERMEDIATE-TERM STATIONARY must be protected by traffic barrier (concrete barrier or guardrail) or a 6:1 or flatter sloped wedge of suitable material compacted in a manner that will provide stability for errant vehicles while maintaining the lane closed.





- If there is a lateral clearance greater than 8 feet between the edge of an open travel lane and 3 inch or greater drop-off is located behind a closed lane and within the roadway, drums may be used as separation.



Drop-offs within 10 Feet of the Travelway

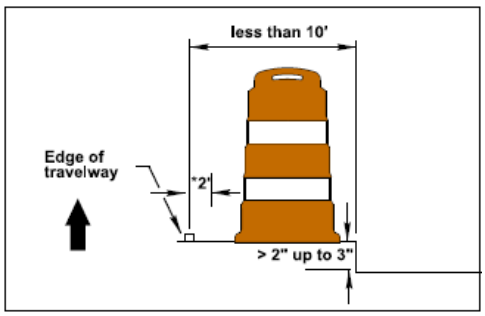
Drop-offs not located in, but within 10 feet of a travelway where traffic is not expected to cross in a lane change maneuver except accidentally or for shoulder use.

A) Drop-offs less than 2 inches:

Where a drop-off of 2 inches or less exists within 10 feet of a travelway, no protection or channelizing devices are required. However, advance warning "LOW SHOULDER" signs (W8-9) shall be installed 500 feet in advance and once every mile throughout the length of the drop-off area.

B) Drop-offs greater than 2 inches but less than or equal to 3 inches:

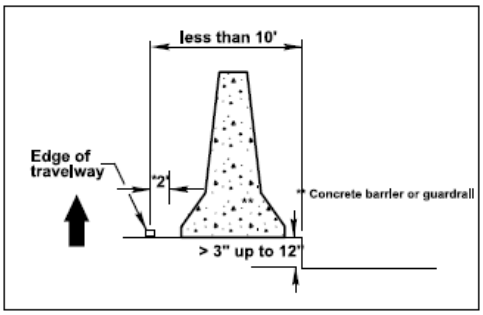
Where a drop-off within 10 feet of a travelway is greater than 2 inches but is less than or equal to 3 inches the drop-off shall be protected with drums or cones. Advance warning "LOW SHOULDER" signs (W8-9) shall be installed 500 feet in advance and once every half mile throughout the length of the drop-off area.



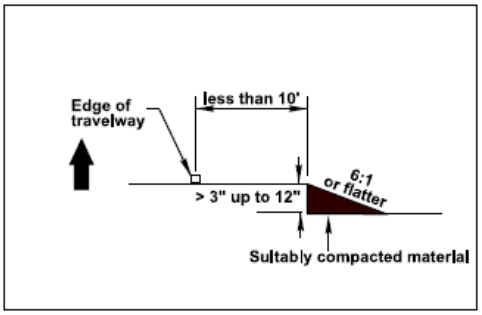
C) Drop-offs greater than 3 inches but less than or equal to 12 inches:

Where a drop-off greater than 3 inches exists within 10 feet of a travelway the drop-off shall be protected with one of the following treatments:

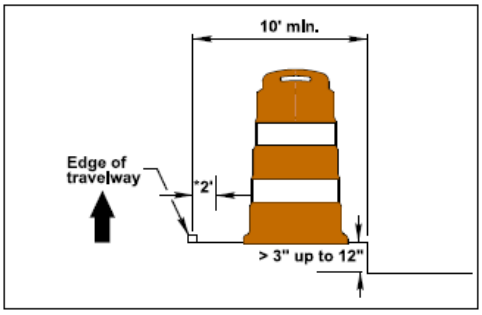
1. Drop-off protected by traffic barrier (concrete barrier or guardrail)



2. Drop-off protected with a 6:1 or flatter wedge slope of suitable material compacted in a manner that will provide stability for errant vehicles and drums or cones installed for separation.



3. Provide a lateral distance of 10 feet from the drop-off to the open travel lane by shifting traffic and installing drums or cones for separation.

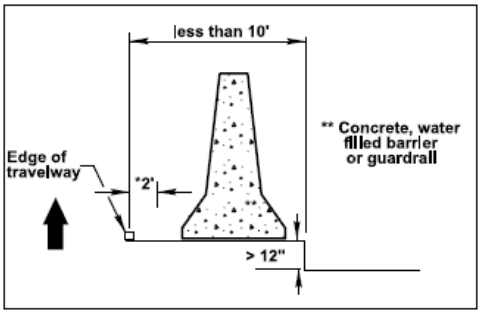


Advance warning "SHOULDER DROP-OFF" signs (W8-9a) shall be installed 500 feet in advance and once every one mile throughout the length of the drop-off area.

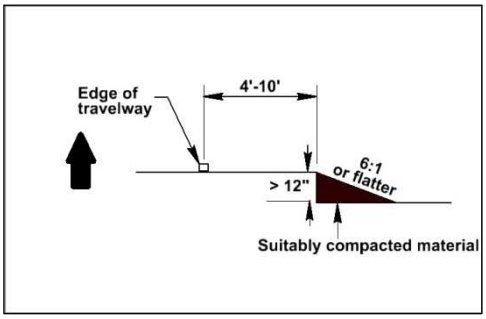
D) Drop-offs greater than 12" (posted speed limits less than 45 mph):

Where a drop-off greater than 12 inches exists within 10 feet of a travelway the drop-off shall be protected with one of the following treatments:

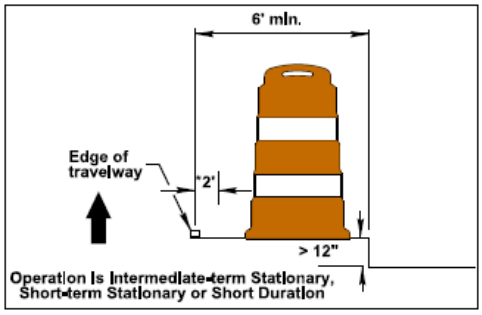
1. Drop-off protected by traffic barrier (concrete or water filled barrier or guardrail)



2. Drop-off protected with a 6:1 or flatter wedge slope of suitable material compacted in a manner that will provide stability for errant vehicles



3. Provide a lateral distance of 6 feet from the drop-off to the open travel lane by shifting traffic; if the situation exists for 3 days or less, the drop-off shall be delineated with drums installed at ½ the normal spacing; if the drop-off will remain for more than 3 days, traffic barrier (concrete or water-filled barrier or guardrail) shall be used to separate the traffic from the drop-off. In situations where drums are used to delineate the drop-off, the traffic control shall be inspected no less than once every 8 hours.

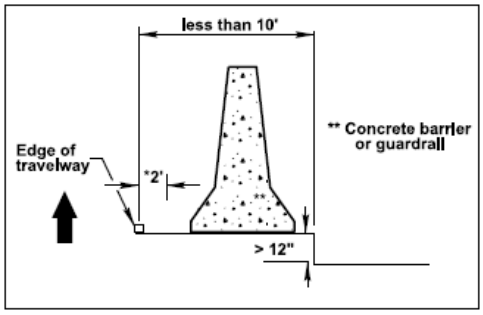


Advance warning "SHOULDER DROP-OFF" signs (W8-9a) shall be installed 500 feet in advance and once every half mile throughout the length of the drop-off area.

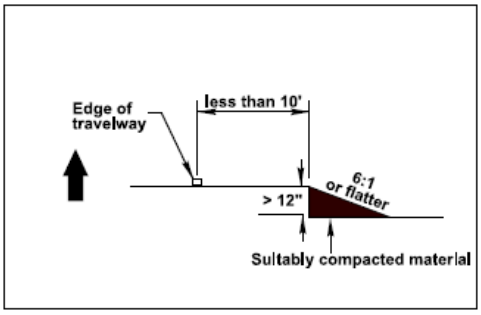
E) Drop-offs greater than 12" (posted speed limits of 45 mph or greater):

Where a drop-off greater than 12 inches exists within 10 feet of a travelway the drop-off shall be protected with one of the following treatments:

1. Drop-off protected by traffic barrier (concrete barrier or guardrail)



2. Drop-off protected with a 6:1 or flatter wedge slope of suitable material compacted in a manner that will provide stability for errant vehicles and drums or cones installed for separation.



Advance warning "SHOULDER DROP-OFF" signs (W8-9a) shall be installed 500 feet in advance and once every mile throughout the length of the drop-off area.

F) Localized excavations (construction inactivity):

Localized excavations (for drop inlets, drainage boxes, bore & jack pits, etc.) existing within 10 feet of a travelway which exceed 36" during periods of construction inactivity shall be protected with one of the following treatments:

- Traffic barrier (concrete barrier or guardrail)

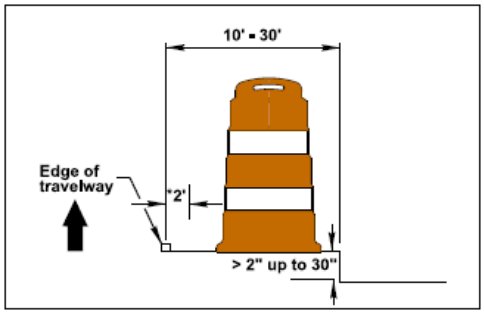
Drop-offs 10 to 30 Feet from the Travelway

A) Drop-offs 2 inches or less:

Where a drop-off of 2 inches or less exists between 10 feet and 30 feet of a travelway, no protection or channelizing devices is required. However, advance warning "LOW SHOULDER" signs (W8-9) shall be installed 500 feet in advance and once every mile throughout the length of the drop-off area.

B) Drop-offs greater than 2 inches but less than or equal to 30 inches:

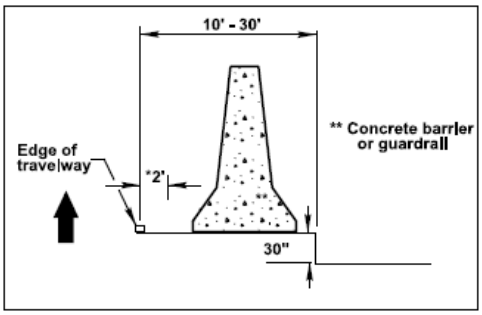
Where a drop-off exists between 10 feet and 30 feet of a travelway is greater than 2 inches but is less than or equal to 30 inches the drop-off shall be protected with drums or cones. Advance warning "LOW SHOULDER" signs (W8-9) shall be installed 500 feet in advance and once every half mile throughout the length of the drop-off area.



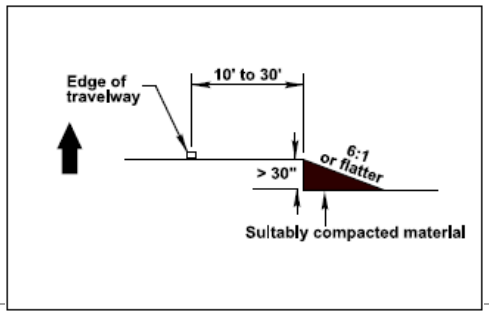
C) Drop-offs greater than 30 inches:

Where a drop-off greater than 30 inches exists between 10 feet and 30 feet of a travelway the drop-off shall be protected with one of the following treatments:

1. Drop-off protected by traffic barrier (concrete barrier or guardrail)



2. Drop-off protected with a 6:1 or flatter wedge slope of suitable material compacted in a manner that will provide stability for errant vehicles and drums or cones installed for separation.



TERRAIN HAZARDS

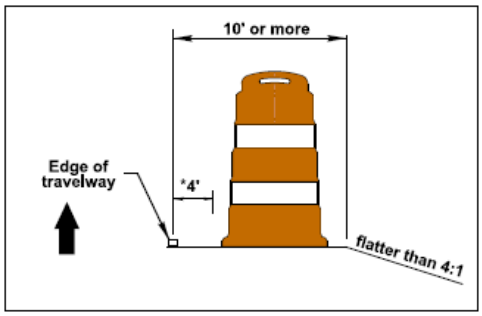
Hazards Located 10 Feet and Greater from the Travelway

Terrain hazards located 10 feet and greater from the travelway where traffic is not expected to cross, unless accidentally.

A) Embankment or fill slopes (recoverable):

Recoverable slopes (flatter than 4:1) existing 10 feet and greater from the travelway shall be protected with the following treatment:

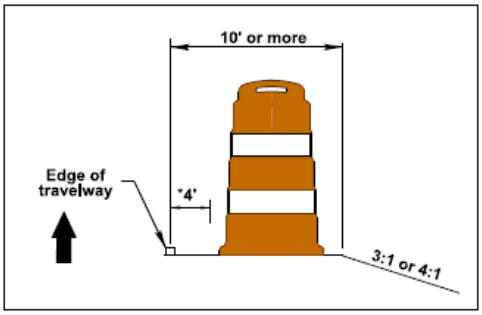
- Drums or cones



B) Embankment or fill slopes (non-recoverable):

Non-recoverable slopes (3:1 and 4:1) existing 10 feet and greater from the travelway shall be protected with the following treatment:

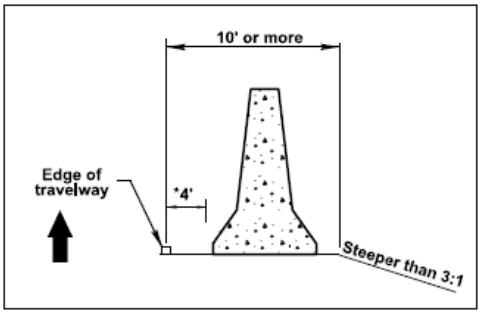
- Drums or cones



C) Critical Slopes:

Critical slopes (steeper than 3:1 existing 10 feet and greater from the travelway shall be protected with the following treatment:

- Traffic barrier (concrete barrier or guardrail)



D) Curbs:

- Guardrail adjacent to curb (guardrail face installed even with the curb face)
- Concrete barrier installed in front of curb face (on the gutter line)
- Concrete barrier placed a maximum of 9 inches behind curb face if work is being performed within the travelway or a minimum of 13 feet behind the curb face if work is being performed behind curb.

FIXED OBSTACLES

Fixed and Non-traversable Hazards 10 - 30 Feet from the Travelway

Fixed and non-traversable hazards existing 10 to 30 feet from the travelway where traffic is not expected to cross, unless accidentally. Fixed and non-traversable hazards existing less than 10 feet from the travelway require a lane closure.

A) Portable Changeable Message Signs and Arrow Panels Existing 10 – 30 Feet from the Travelway:

Portable changeable message signs and arrow panels existing between 10 and 30 feet from the travelway shall be protected with one of the following treatments:

- Drums or cones

B) Portable Highway Sensors Existing 10 - 30 Feet from the Travelway:

Portable highway sensors existing between 10 and 30 feet from the travelway shall be protected with the following treatment:

- Drums or cones